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# WORK PLAN (ADDENDUM NO. 1) FOR GROUNDWATER INVESTIGATION

Brix Maritime Company Facility
9030 NW St. Helens Road
Portland, Oregon

March 18, 2002



**HAHN AND ASSOCIATES, INC.**
**Environmental Management**

434 NW 6th Avenue, Suite 203
Portland, Oregon 97209-3600
503/796-0717 • 503/227-2209 FAX

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Brix Maritime Company Facility
9030 NW St. Helens Road
Portland, Oregon

March 18, 2002

Prepared for:

Brix Maritime Company
Portland, Oregon

Prepared by:

Hahn and Associates, Inc.
Portland, Oregon

Project No. 5074

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(continued)

**HAHN AND ASSOCIATES, INC.**
ENVIRONMENTAL CONSULTANTS

# WORK PLAN (ADDENDUM NO. 1) FOR GROUNDWATER INVESTIGATION

Brix Maritime Company Facility
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Portland, Oregon

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## 1. INTRODUCTION

Brix Maritime Company (Brix) has retained Hahn and Associates, Inc. (HAI) to prepare this Groundwater Investigation Work Plan (Addendum No. 1) to supplement the Work Plan for Underground Storage Tank Investigation[1] for the Brix Maritime Company facility (the "Site") located at 9030 NW St Helens Road, Portland, Oregon (Figure 1). Brix is conducting this Work voluntarily in order to gather additional data to support the conclusions contained in the most recent Sampling Results Report[2].

This Work Plan Addendum includes discussion under the following major headings:

- Background (Section 2.0)
- Preliminary Conceptual Hydrogeologic Site Model (Section 3.0)
- Groundwater Investigation Objectives (Section 4.0)
- Site Characterization Plan (Section 5.0)
- Sampling and Analysis Plan (Section 6.0)

## 2. BACKGROUND

Previous investigation activities relating to the Site have been provided in previous reports with the most-recent summary presented in the Sampling Results Report (Anchor Environmental, LLC, 2001) that will not be repeated in detail here.

## 3. PRELIMINARY CONCEPTUAL HYDROGEOLOGIC SITE MODEL

A preliminary conceptual hydrogeologic site model is presented herein based on the investigation activities conducted to-date at the Site. The information gathered during the groundwater investigation activities proposed in this Work Plan Addendum (No. 1) will subsequently be utilized to modify or reconstruct the conceptual model, as necessary.

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[1] Hahn and Associates, Inc. (2001). *Work Plan for Underground Storage Tank Investigation, Brix Maritime Company Facility, 9030 NW St. Helens Road, Portland, Oregon*. May 11, 2001.

[2] Anchor Environmental, LLC, (2001). *Sampling Results Report in Support of the Preliminary Assessment of the Brix Maritime Company Facility*. September 2001.

3.1 Site Geology

The geologic units of interest at and in the vicinity of the Site can be subdivided as follows, from youngest to oldest:

- Fill Deposits
- Alluvial Deposits
- Columbia River Basalt Group

The oldest and lowermost geologic unit of interest beneath the site consists of the Columbia River Basalt Group. The Miocene-age Columbia River Basalt, composed of a series of individual lava flows, generally forms the base (bedrock) of the Portland Basin and outcrops to the southwest of the Site in the Tualatin Mountains. Beneath the nearby Northwest Natural Gasco site, located approximately 3,000 feet southeast and up-river of the Site, the basalt surface was encountered at a depth as shallow as 36 feet bgs near St. Helens Road, but was estimated to be at depths greater than 200 feet bgs adjacent to the Willamette River.

Overlying the Columbia River Basalt, Quaternary-age Alluvial Deposits, composed primarily of unconsolidated sand and silt, are present along the Willamette River in the area. Apparent Alluvial Deposits, consisting primarily of silty clay (Silty Clay Unit), were encountered beneath the Brix site at depths ranging between 19 feet bgs (B-30) and 25 feet bgs (B-3, B-4, and B-15) (Figure 3). In general, the Silty Clay Unit appears to be shallower in the southwest portion of the Site becoming progressively deeper to the northeast towards the Willamette River (Figure 4).

Most properties along the Willamette River have been subjected to varying degrees of fill. The Brix Site has been filled with mixtures of gravelly sand, sand, and silty sand (Figure 4). The source of the fill deposits are not known. The Sand Fill Unit was encountered at all borings installed at the Site to depths up to 25 feet bgs.

3.2 Site Hydrogeology

Groundwater at nearby sites along the Willamette River generally occur in three principal hydrogeologic zones, including the unconfined shallow (Fill Deposit) water-bearing zone (WBZ), the semi-confined Alluvial Deposit WBZ, and the confined bedrock aquifers in the Columbia River Basalts. During the May 2001 investigation, groundwater was observed beneath the Site at depths ranging between 23 and 32 feet bgs. In May 2001, groundwater was not found to be present, or perched within the Sand Fill Unit (Figure 4). However, May 2001 appeared to represent a relatively low water table based on hydrograph evidence from the nearby Gasco Site. Accordingly, it is presumed that groundwater will be present in the Sand Fill Unit during higher water table periods.

The overall regional groundwater flow regime in the vicinity of the Site is impacted by two primary features. The Tualatin Mountains generally form a regional groundwater recharge boundary southwest of the Site, and the Willamette River forms a regional groundwater discharge boundary northeast of the Site. Direct measurement of groundwater flow direction and hydraulic gradients has not been conducted at the Site.

However, based on measurements for sites similarly located along the Willamette River, net groundwater flow within the shallow Fill Deposit and/or Alluvial Deposit WBZ is towards the Willamette River. Similarly, net groundwater flow beneath the Brix Site is inferred to be towards the Willamette River. The groundwater contaminant plume distribution detected at the Site appears to support the inferred direction of groundwater flow.

It is expected that groundwater within the Alluvial Deposit WBZ is hydraulically connected to the Willamette River with groundwater levels being directly influenced by river stage levels. Furthermore, in the event that seasonal variation caused groundwater to be present within the Sand Fill Unit, it too would be expected to be hydraulically connected to the Willamette River. High water levels are typically from January to March, with June often being a high water month due to snow melt. Low water table typically occurs in September and October. The Gasco site shows typical seasonal groundwater fluctuations on order of 3 to 6 feet with occasional extremes of over 20 feet. These fluctuations suggest the Sand Fill Unit will be water-bearing during parts of a typical year.

## 3.3 Contaminant Sources, Transport, and Fate

### 3.3.1 Potential Contaminant Sources

The primary potential sources for petroleum contamination of soil and groundwater relate to the UST system at the Site as follows:

1) The former gasoline dispenser area
2) The former 30-weight oil pipeline area
3) Potential former spill and/or overfill in the vicinity of UST #4 and UST #5.

### 3.3.2 Transport and Fate

Released petroleum contaminants migrate through soils by gravity flow as product, volatilization to soil vapor, and solution in infiltrating groundwater. Contaminant migration induced by gravity flow and infiltrating water will generally be downward through the unsaturated zone with lateral flow increasing as the product comes into contact with finer-grained sediments (silts/clays) and/or with cemented formations. Soils have the ability to absorb petroleum product, with finer grained soils having the capacity to adsorb more product. Depending on the soil type and size of the release, the soils may adsorb all the free-product and trap it in the unsaturated zone as a soil plume. However, if the adsorptive capacity of the soil is exceeded, then the product continues to migrate to the groundwater table where it becomes free-product.

Free-product, if present, will initially spread on the top of the groundwater table and migrate in a down-gradient direction. Subsequent fluctuations in water table will promote vertical spreading of the free-product plume throughout a "smear" zone in the soil. Eventually the free-product plume may be entirely adsorbed by the soils in the smear zone. The presence of free-product and/or an adsorbed soil plume at or below the water table contributes to the development of a dissolved contaminant plume in the groundwater. The

dissolved contaminant plume will migrate by dispersion and in the direction of groundwater flow by advection.

At the subject site, although high concentrations of petroleum hydrocarbons have been detected in soil (diesel and oil-range up to 53,000 ppm), visual evidence of free-product has not been observed. Gasoline-range, diesel-range, and oil-range petroleum hydrocarbons in soil were detected at depths of 3 to at least 24.5 feet bgs with gasoline concentrations ranging between 1.14 and 2,000 parts per million (ppm), and combined diesel and oil-range petroleum hydrocarbons ranging between 49 and 53,000 ppm. The testing results indicate soil impacts appear limited to the Sand Fill Unit, with soil impacts generally absent in the Silty Clay Unit at the site (Figures 3 and 5).

Sources of petroleum release have been removed at all release areas identified including repair of the 30-weight oil pipeline area, removal of the former gasoline fuel dispenser, and upgrade of equipment where the apparent overfill and/or spill was identified in the vicinity of UST #4 and UST #5. Additionally, the mass of soil impact has been decreased in the vicinity of the 30-weight oil line area by a 1993 soil removal action. Since the site has always been paved with asphalt and/or concrete , significant downward leaching from infiltrating rainwater is unlikely. Accordingly, it appears petroleum impacts are present in groundwater beneath the Site through seasonal fluctuations of the water table occasionally intersecting soil impact. Based on the investigations to-date, it appears that groundwater impacts beneath the Site are present in the dissolved phase including benzene, propylbenzenes, trimethylbenzenes, naphthalene, and various PAHs. The highest detected petroleum concentrations in groundwater (at B-17) appear to be gasoline related, and are found down-gradient of the gasoline dispenser release.

The conceptual hydrogeologic model for this site suggests net flow of shallow groundwater beneath the site is to the northeast towards the Willamette River. Groundwater contaminant plume distribution detected at the site appears to support the assumed direction of groundwater flow (Figure 6). The fate of the groundwater plume toward the Willamette River is not definitively known, and is the subject of the groundwater investigations proposed herein.

## 4. GROUNDWATER INVESTIGATION OBJECTIVES

The objectives of work proposed in Work Plan Addendum No. 1 are to:

1) Install monitoring wells at the site
2) Establish groundwater flow direction
3) Evaluate seasonal trends in groundwater and surface water elevations
4) Evaluate seasonal trends in groundwater quality
5) Evaluate the groundwater to surface water pathway
6) Gather sufficient information to support the conclusions contained in the Sampling Results Report (Anchor Environmental, LLC).

## 5. SITE CHARACTERIZATION PLAN

The Site Characterization Plan for the groundwater investigation activities includes the following general components:

1) Monitoring well installation (locations and depths)

2) Water level monitoring

3) Groundwater quality monitoring

4) Physical features and elevation survey

5) Investigative-derived waste (IDW) management

6) Report preparation

All work activities, unless otherwise specified herein, will be carried out according to the May 2001 Work Plan for UST Investigation.

### 5.1 Monitoring Well Installation

#### 5.1.1 Monitoring Well Locations

Four (4) shallow monitoring wells (MW-1, MW-2, MW-3, and MW-4) is proposed for installation at the site (Figure 6). The proposed monitoring wells have been located based on the following criteria:

1) Upgradient and downgradient of areas of potential soil and groundwater impacts

2) At locations suitable for evaluation of the groundwater to surface water pathway; i.e. along the riverfront

MW-1 will be placed in an upgradient location for the purpose of determining baseline groundwater quality at the site and for groundwater flow direction triangulation purposes. Three monitoring wells, MW-2, MW-3, and MW-4, will be located in downgradient locations with respect to potential source areas to monitor groundwater quality, assess plume stability, and to evaluate the groundwater to surface water pathway.

#### 5.1.2 Monitoring Well Depths

Investigation activities conducted at the Site in May 2001 indicate groundwater occurred at an average depth of 27 feet bgs, but may be as deep as 32 feet bgs. Monitoring wells are proposed for installation to a depth of 35 feet bgs with a 15-foot screen interval to ensure adequate groundwater for sampling purposes. MW-4 is proposed for placement on an access road approximately 24 feet below the elevation of the UST area. Accordingly, this well will be installed to a depth of approximately 15 feet bgs with a 10-foot screen interval. An example schematic monitoring well construction diagram is depicted in Figure 7. Monitoring well construction, surface completion, and development will follow procedures outlined in the Sampling and Analysis Plan (SAP) (Section 6.0).

At each well, the screen interval will span both the Sand Fill Unit and the Silty Clay Unit (Alluvial Deposit WBZ). Spanning each of these units will allow groundwater quality present in each unit to be evaluated utilizing one monitoring well.

5.2 Water Level Monitoring

Water level monitoring will be conducted at the monitoring wells every two months through one seasonal cycle (February through October). In addition, Willamette River stage data at the Morrison Bridge will be monitored during each monitoring event via the United States Geological Survey (USGS) website to assess the relationship between Site groundwater and river stage. The results of the water level monitoring will be included in each of the two report deliverables that are to be prepared for the Site (Section 5.6).

5.3 Groundwater Quality Monitoring

Following installation of the monitoring wells, an initial round of groundwater sampling will be conducted at the Site. Groundwater samples will be analyzed for the presence of the following:

1) BTEX compounds
2) PAHs (including naphthalene)
3) Methyl-tert-butyl-ether (MTBE)
4) Ethylene dibromide [1,2-dibromomethane (EDB)] and ethylene dichloride [1,2-dichloroethane (EDC)]
5) 1,2,4-TMB and 1,3,5-TMB
6) iso-propylbenzene and n-propylbenzene
7) Lead

Based on the results of the water level elevation monitoring and the groundwater quality sampling event, a determination will be made as to the need for continued monitoring at the site. All monitoring well quality assurance and quality control (QA/QC) will follow Section 5.7 of the UST Investigation Work Plan (HAI 2001). A summary of QA/QC samples for the groundwater sampling event is included on Table 1.

5.4 Physical Features and Elevation Survey

All monitoring wells will be surveyed for relative location and elevation to the City of Portland Datum by an Oregon registered land surveyor. For monitoring wells, both the ground surface and the top of the casing elevations will be surveyed. All survey data will be collected within an accuracy of 0.01 feet vertically and 0.1 feet horizontally. Relevant physical features and former boring locations, if visible, will also be surveyed in order to compile an accurate map of the study area and support the conceptual hydro geologic site model; however, legal property boundaries will not be surveyed.

5.5 Investigative-Derived Waste (IDW) Management

Investigative derived waste (IDW) will be managed in a manner that is consistent with the U.S. Environmental Protection Agency (EPA) *Guide to Management of Investigation Derived-Wastes* dated January 1992 as detailed in Section 5.6 of the UST Investigation Work Plan (HAI 2001).

5.6 Report Deliverable

Following completion of the monitoring well installation activities and the groundwater sampling event, a report will be prepared summarizing the monitoring well installation and sampling, and the results of the groundwater sampling event.

## 6. SAMPLING AND ANALYSIS PLAN

The Sampling and Analysis Plan (SAP) is designed to cover groundwater characterization and investigation activities conducted at the Site with the primary focus on investigation of upland UST areas. The SAP includes a description of procedures and sampling methodologies that will be necessary to carry out those activities detailed in the Site Characterization Plan.

6.1 Monitoring Well Construction

All monitoring well installation activities will be conducted in accordance with the Oregon Groundwater Law (Oregon Revised Statute (ORS) Chapter 537) and the Rules for Construction and Maintenance of Monitoring Wells and Other Holes in Oregon (Oregon Administrative Rules (OAR) Chapter 690, Division 240).

Drilled monitoring wells will be installed through 6 3/4-inch ID hollow stem augers. The monitoring wells will be constructed with 2-inch ID, threaded, schedule 40, polyvinyl chloride (PVC) blank casing and slotted screen. Typically, fifteen (15) feet of slotted screen will be set at the bottom of each borehole with blank casing extending to the ground surface.

A sand pack will be placed in the annular space from the bottom of the borehole to 2 feet above the top of the screen with silica sand. The wells will then be developed with a surge block to set the sand pack. In shallow wells (less than 25 feet of water in the annular space), a well seal composed of 3/8-inch bentonite chips will be placed on top of the sand pack to a depth of about 2 feet bgs and hydrated.

Monitoring wells will be completed with flush well monuments cemented in at the surface. However, since there may be instances where above-ground monuments will be advantageous, their suitability will be evaluated while in the field. Above-ground monuments will require the installation of three surrounding guard posts. All well casings will be fitted with locking caps.

A summary of monitoring well depths and screen interval is presented in Table 1.

6.2 Monitoring Well Development

At least 24 hours following installation, monitoring wells will be further developed. Purging with either a submersible or peristaltic pump in an attempt to remove the fine sediment from around the borehole will develop the wells. During development, at least 10 volumes of water will be removed from each well. The parameters pH, temperature, and conductivity will be measured with a Hydac probe during the development process. The well will be considered developed when the parameters of pH, temperature, and conductivity have stabilized and the water does not appear turbid. Stabilization is considered to have been met when the last three measured values for each of the above parameters are within 10 percent of each other and the water appears clear to the eye.

6.3 Water Level Measurements

Prior to a monitoring well sampling event, and at any other designated water level monitoring events, the static water levels in monitoring wells will be measured to the nearest 1/100$^{th}$ of a foot with a Solinst water level indicator (conductive probe). The water levels will be measured from the north side of the top of the casing where a notch will be cut. The Willamette River water level stage will also be obtained through the USGS website during each water level monitoring event.

6.4 Soil Sampling Procedures

Soil samples will be collected, described, and screened according to Section 5.3 of the UST Investigation Work Plan (HAI 2001). Specifically, soil samples will be collected with a split-spoon sampling device at 2.5 to 5-foot intervals, with the frequency of soil sampling increasing to a 2.5-foot interval past a depth of 17.5 feet bgs to better define the depth of the Silty Clay Unit at the Site. Collection of soil samples for laboratory analysis is not proposed at this time since soils have been well characterized at the Site. In the event that soil impacts are observed during drilling based on field screening, the soil will be sampled and analyzed for gasoline, diesel, and oil-range total petroleum hydrocarbons (TPH) by Northwest Methods TPH-G and TPH-Dx. In addition, selected petroleum constituents may be analyzed.

6.5 Groundwater Sampling Procedures

At least 72 hours following development of the monitoring wells, the groundwater in monitoring wells will be sampled. Prior to sampling, at least three well casing volumes of water will be purged from each well using a peristaltic purge pump equipped with new polyethylene tubing. If water levels fall below 20 feet during purging of any of the wells, then a decontaminated submersible pump may be necessary for purging and sampling activities. The pH, temperature, and conductivity of the purged water will be measured with a Hydac probe to assess for stabilization of these parameters. Stabilization is considered to have been met when the last three measured values for each of the above parameters are within 10 percent of each other.

A representative sample of the groundwater will then be obtained using the peristaltic or submersible pump at a low flow rate. For volatile analyses, the groundwater sample will be collected using a new polyethylene bailer. The water will be carefully transferred to appropriate containers. The sampling containers will be completely filled such that no headspace is present that would allow the loss of volatiles. The sample bottles will then be transferred to a chilled container for shipment to the analytical laboratory.

### 6.6 Analytical Methods and Procedures

Groundwater analyses for the first sampling event will include all identified site COIs as detailed in Section 5.3 of this Work Plan Addendum and follow those analytical methods detailed in the UST Investigation Work Plan (HAI 2001). A summary of the analytical testing program is included on Table 1.

### 6.7 Decontamination Procedures

Decontamination procedures will be conducted according to Section 5.5 of the UST Investigation Work Plan (HAI 2001). In the case where a submersible pump is used, it will be decontaminated by using a detergent (Alconox) solution wash, followed by two separate potable water rinses.

### 6.8 Sample Handling and Documentation Procedures

Sample handling procedures will be conducted according to Sections 5.8 and 5.9 of the Work Plan (HAI 2001). Development, purging, and sampling of monitoring wells will be documented with Groundwater Sampling Summary Forms in Appendix B.

## GLOSSARY OF ABBREVIATIONS

| | |
|---|---|
| ASTM | American Society of Testing and Materials |
| bgs | below existing ground surface |
| BTEX | benzene, toluene, ethylbenzene, and xylene |
| C | degrees centigrade |
| DEQ | Department of Environmental Quality |
| EDB | ethlylenedibromide |
| EDC | ethylenedichloride |
| EPA | U.S. Environmental Protection Agency |
| eV | electron volt |
| ID | inside diameter |
| IDW | investigative-derived waste |
| MTBE | methyltertbutylether |
| NAPL | non-aqueous phase liquid |
| OAR | Oregon Administrative Rule |
| OD | outside diameter |
| ORS | Oregon Revised Statutes |
| OWRD | Oregon Water Resources Division |
| PAHs | polynuclear aromatic hydrocarbons |
| PID | photoionization detector |
| ppm | parts per million |
| PVC | polyvinyl chloride |
| QA | quality assurance/ |
| QC | quality control |
| SCP | Site Characterization Plan |
| SAP | Sampling and Analysis Plan |
| SPT | standard penetration test |
| TMB | trimethylbenzene |
| TPH | total petroleum hydrocarbons |
| USCS | Unified Soil Classification System |
| VOCs | volatile organic compounds |

# TABLES

**TABLE 1**

**Proposed Groundwater Sampling Program**

Work Plan (Addeneum No. 1) for Groundwater Investigation
Brix Maritime Company Facility
9030 NW St. Helens Road
Portland, Oregon

HAI Project No. 5074

| Well Numbers | Proposed Welll Depths (feet bgs) | Estimated Screen Interval (feet bgs) | Tentative Number of Groundwater Samples to be Analyzed | Analytical Parameters |
|---|---|---|---|---|
| MW-1 | 15 | 5 - 15 | 1 | Expanded List VOCs, PAHs, and Dissolved Lead |
| MW-2, MW-3, MW-4 | 35 | 20 - 35 | 3 | Expanded List VOCs, PAHs, and Dissolved Lead |
| Field Duplicate (MW-4) | - | - | 1 | Expanded List VOCs, PAHs, and Dissolved Lead |
| Trip Blank | - | - | 1 | Expanded List VOCs |
| Equipment Blank | - | - | 0 | Based on review of field procedures |

Note:

bgs = below ground surface

PB = propylbenzene

BTEX = benzene, toluene, ethylbenzene, xylene

EDB = ethylene dibromide

EDC = ethylenedichloride (1,2-DCA)

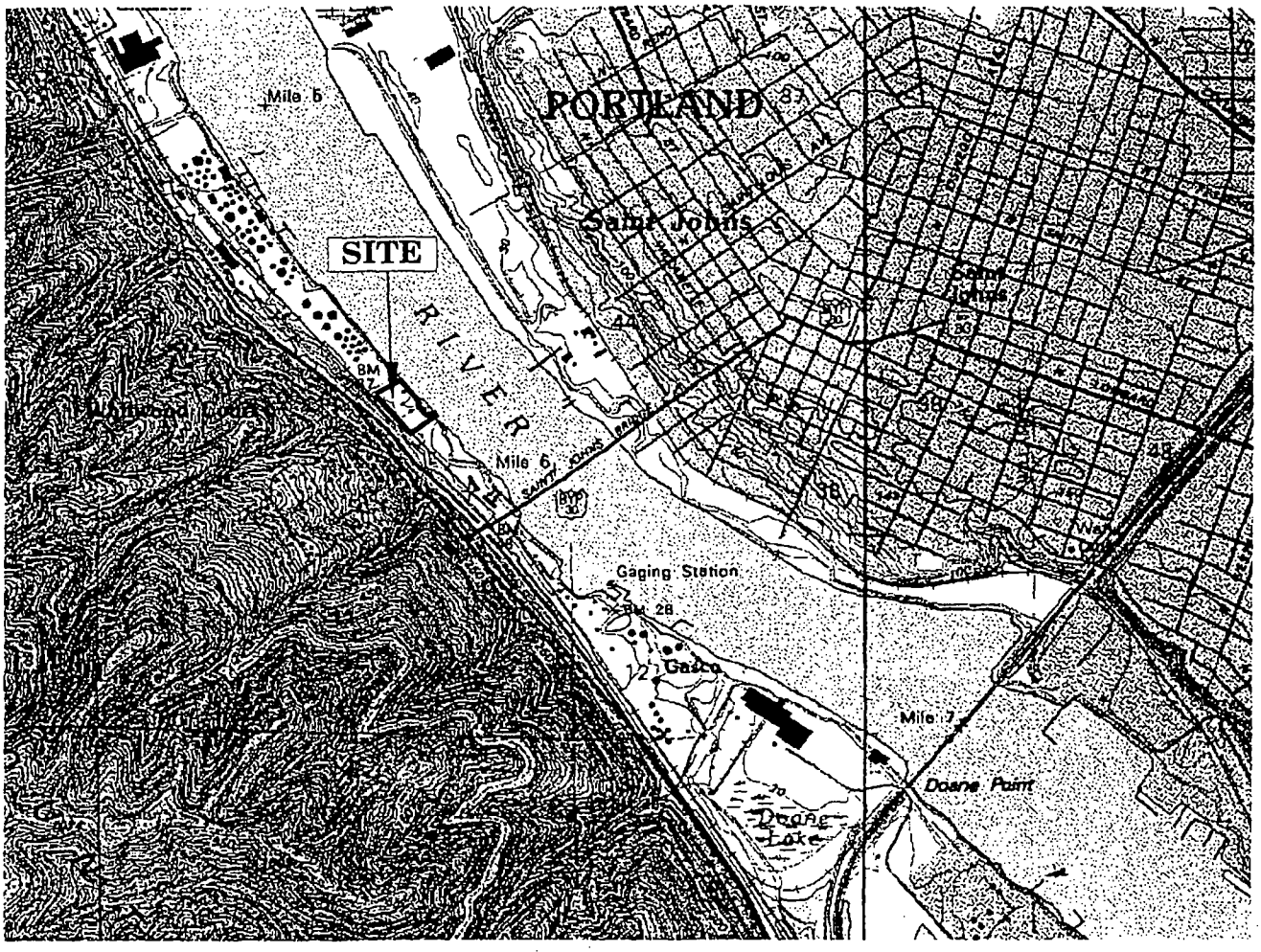
MTBE = methyltertbutylether

PAHs = polynuclear aromatic hydrocarbons

TMB = trimethylbenzene

Expanded List VOCs = BTEX, Naphthalene, EDB, EDC, 1,2,4-TMB and 1,3,5-TMB, iso-PB and n-PB, MTBE

# FIGURES




Source: Linton, Oregon U.S.G.S. 7.5 Minute Quadrangle, 1990
Contour Interval: 10 feet

| | | | |
|---|---|---|---|
| HAI Project No. 5074 | **HAHN and ASSOCIATES** INCORPORATED | **Site Location Map** | **FIGURE** |
| February 2002 | ENVIRONMENTAL MANAGEMENT<br>434 NW SIXTH AVENUE, SUITE 203<br>PORTLAND, OREGON 97209<br>503/796-0717 | Work Plan (Addendum No. 1) for Groundwater Investigation<br>Brix Maritime Company Facility<br>9030 NW St. Helens Road<br>Portland, Oregon | 1 |

# Figure 2

## Site Map

Work Plan (Addendum No. 1) for Groundwater Investigation
Brix Maritime Company Facility
9030 NW St. Helens Road
Portland, Oregon


HAHN AND ASSOCIATES, INC.
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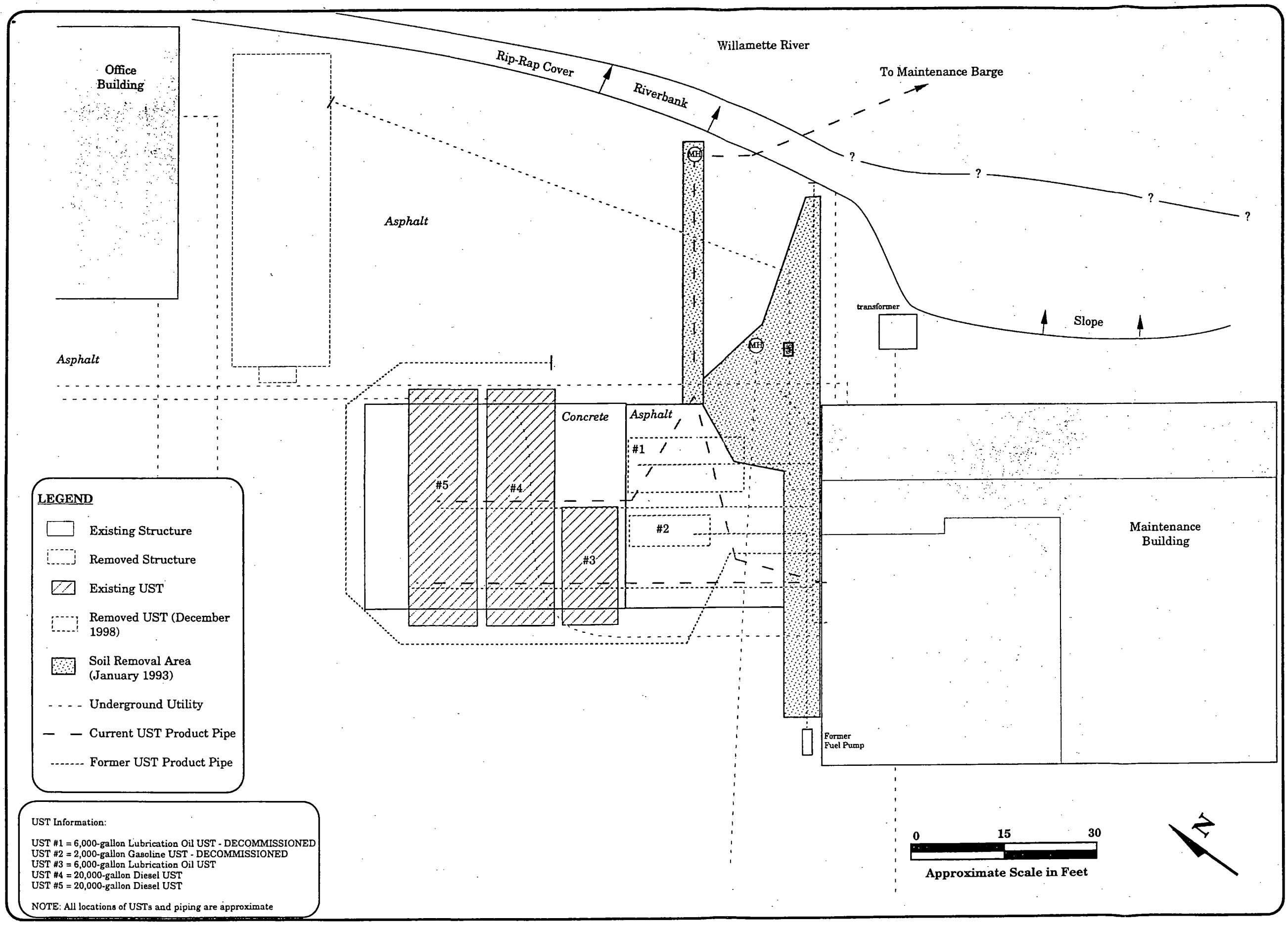
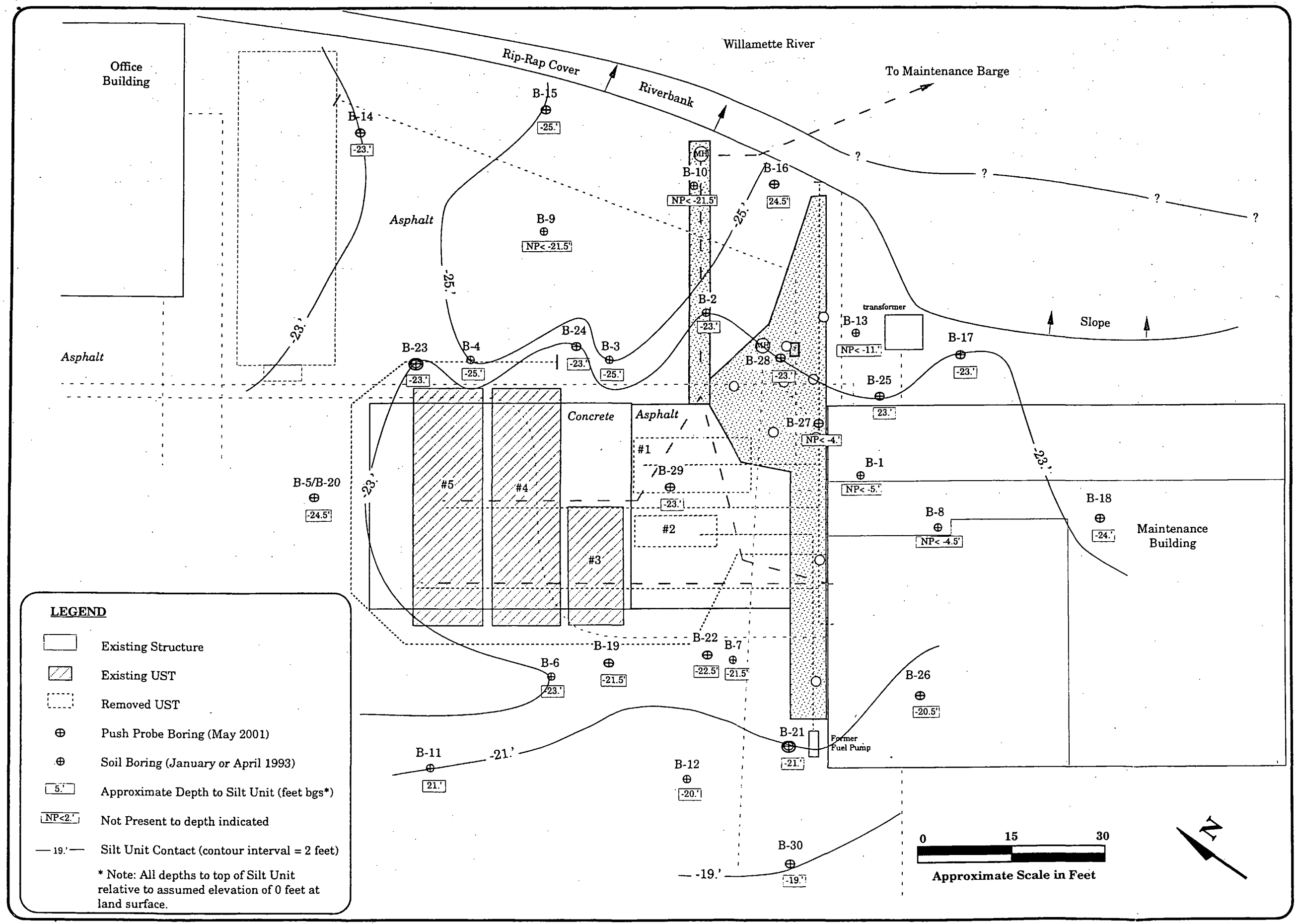
434 NW SIXTH AVENUE, SUITE 203
PORTLAND, OREGON 97209
(503) 796-0717


February 2002

Project No. 5074






**LEGEND**

- Existing Structure
- Existing UST
- Removed UST
- ⊕ Push Probe Boring (May 2001)
- ⊕ Soil Boring (January or April 1993)
- 5.' Approximate Depth to Silt Unit (feet bgs*)
- NP<2.' Not Present to depth indicated
- —19.'— Silt Unit Contact (contour interval = 2 feet)

* Note: All depths to top of Silt Unit relative to assumed elevation of 0 feet at land surface.

# Figure 3

## Depth to Top of Silty Clay Unit Contour Map

Work Plan (Addendum No. 1) for Groundwater Investigation
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A (Southwest)

A' (Northeast)

B-30

Former Gasoline Dispenser

B-21

Projected B-19

Projected B-29

Land Surface

B-28

B-16

Projected B-15

Approximate Depth Below Ground Surface (feet)

0

5

10

15

20

25

30

Sand Fill Unit

Approximate UST Pit

Sand Fill Unit

Alluvial Silty Clay Unit

Estimated Willamette River

0 10 20

Approximate Scale in Feet

Vertical Exaggeration = 2.5X

**LEGEND**

B-1 Push Probe Boring (May 2001)

Depth to Groundwater (May 2001)

Temporary Well Point Screen Interval

All push probe depths relative to land surface datum assumed to be 0 feet

**Soil Classification Key**

GM - Gravelly Sand

SW/SP - Sand

SM - Silty Sand

CL - Silty Clay

Organic Material

**Figure 4**

**Cross Section A - A'**

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**Project No. 5074**

# Figure 5

## Petroleum Hydrocarbons in Soil

Work Plan (Addendum No. 1) for Groundwater Investigation
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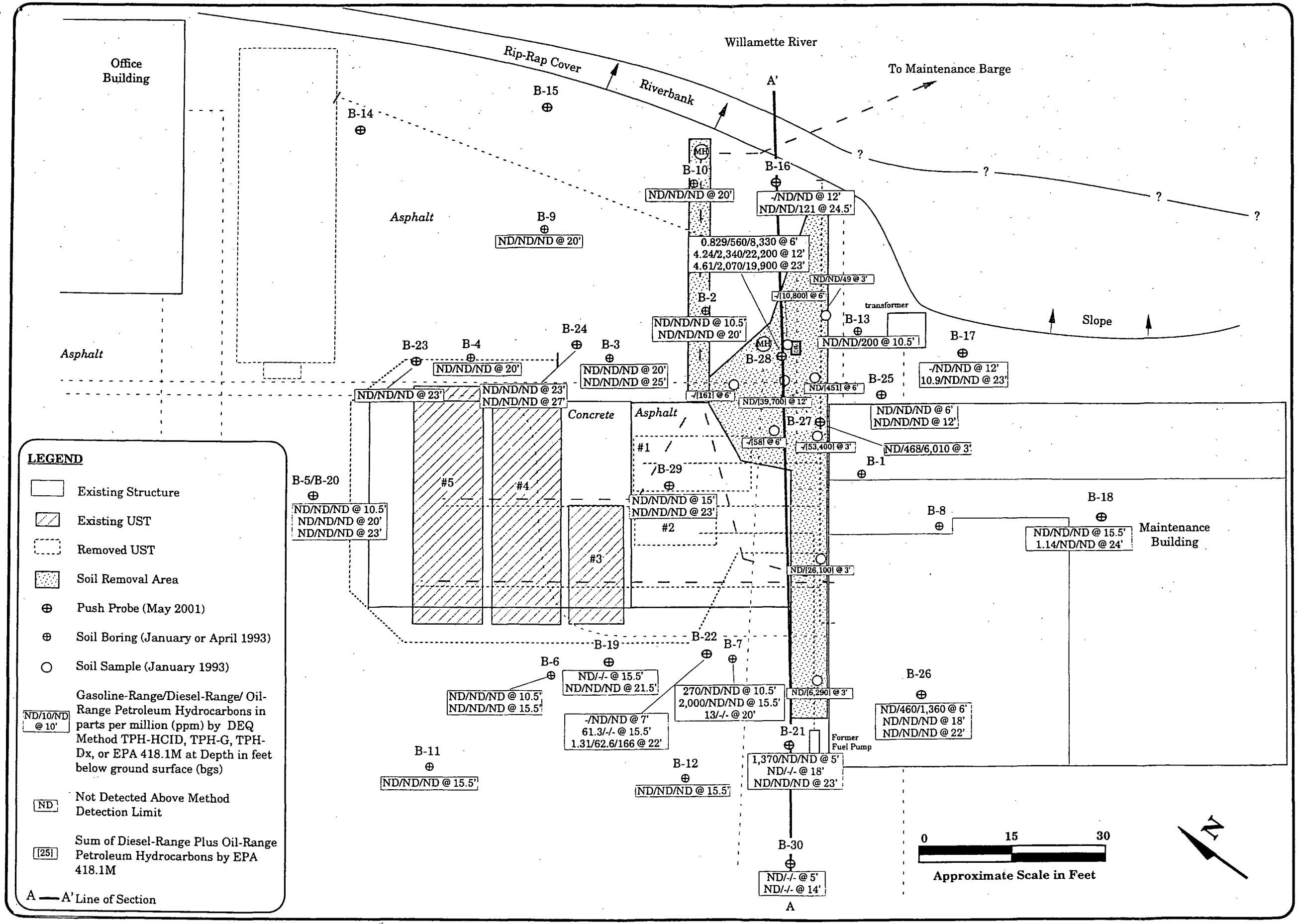


**LEGEND**

- Existing Structure
- Existing UST
- Removed UST
- Soil Removal Area
- ⊕ Push Probe (May 2001)
- ⊕ Soil Boring (January or April 1993)
- ○ Soil Sample (January 1993)
- ND/10/ND @ 10' — Gasoline-Range/Diesel-Range/ Oil-Range Petroleum Hydrocarbons in parts per million (ppm) by DEQ Method TPH-HCID, TPH-G, TPH-Dx, or EPA 418.1M at Depth in feet below ground surface (bgs)
- ND — Not Detected Above Method Detection Limit
- [25] — Sum of Diesel-Range Plus Oil-Range Petroleum Hydrocarbons by EPA 418.1M
- A — A' Line of Section


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ENVIRONMENTAL MANAGEMENT
434 NW SIXTH AVENUE, SUITE 203
PORTLAND, OREGON 97209
(503) 796-0717


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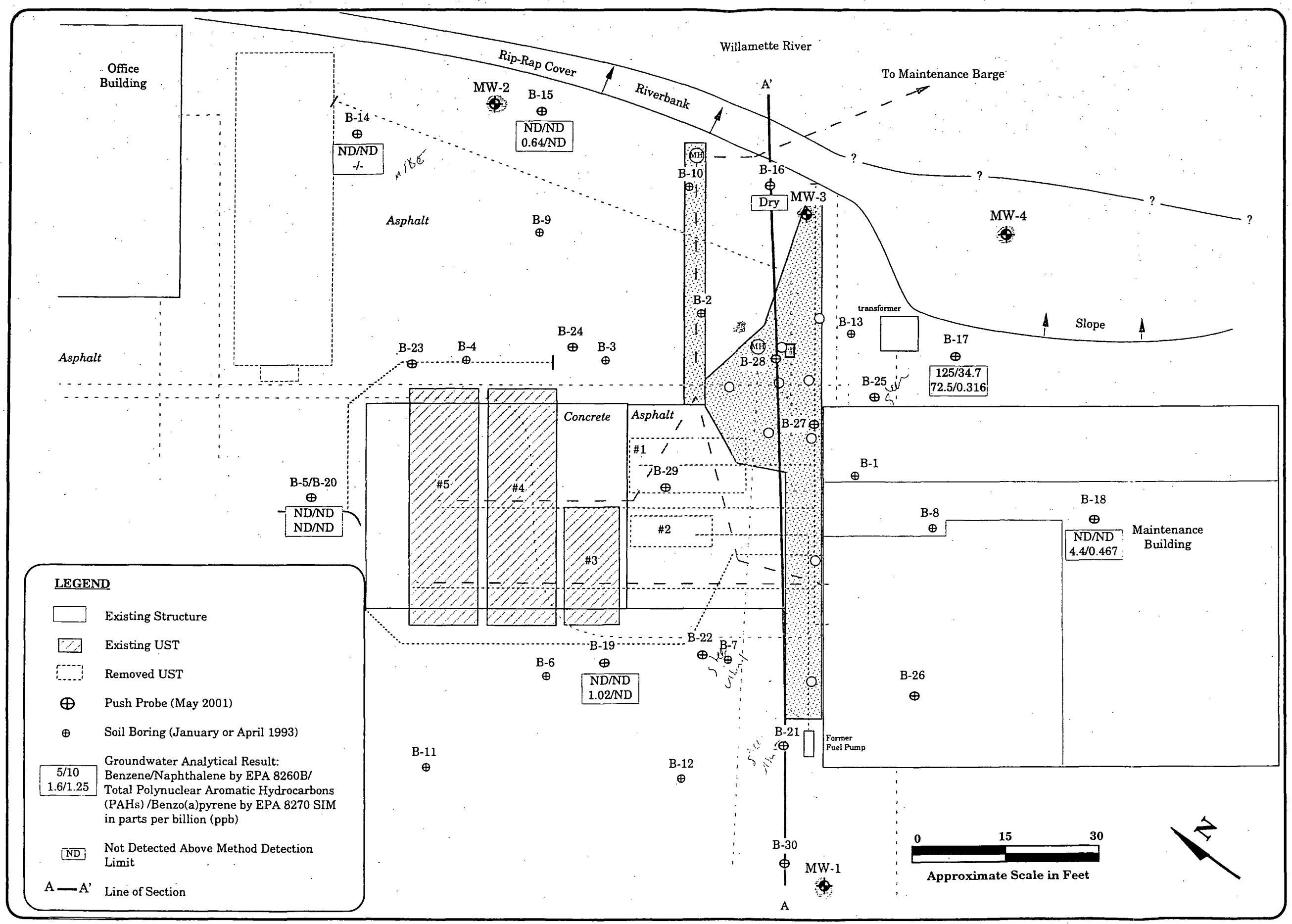


# Figure 6

**Proposed Monitoring Well Locations**

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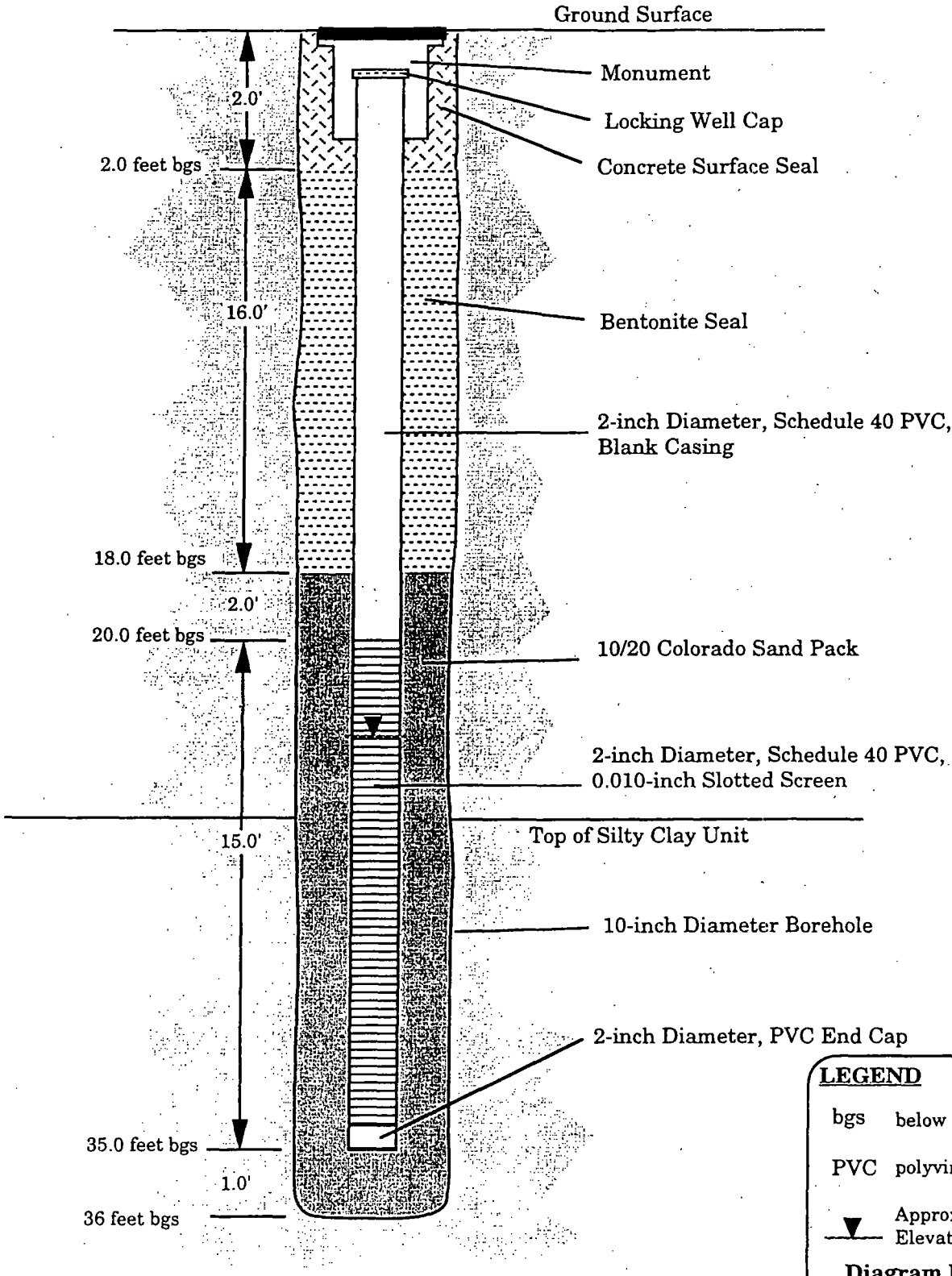


| | | | |
|---|---|---|---|
| Project No. 5074 | HAHN AND ASSOCIATES INCORPORATED | Schematic Monitoring Well Construction | FIGURE |
| February 2002 | ENVIRONMENTAL MANAGEMENT<br>434 NW SIXTH AVENUE, SUITE 203<br>PORTLAND, OREGON 97209<br>(503) 796-0717 | Work Plan (Addendum No. 1) for Groundwater Investigation<br>Brix Maritime Company Facility<br>9030 NW St. Helens Road<br>Portland, Oregon | 7 |